

Prepared by

OKLAHOMA

DEPARTMENT OF ENVIRONMENTAL QUALITY

APRIL 4, 1996



THE OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY RECORD OF DECISION DOCUMENT FOR THE SOIL REMEDIATION UNIT OF THE BLACKWELL ZINC SITE BLACKWELL, OKLAHOMA

April 4, 1996

SITE NAME AND LOCATION

The Blackwell Zinc Site is located near the intersection of Thirteenth Street and State Highway 11 in Blackwell, Kay County, Oklahoma.

STATEMENT OF BASIS AND PURPOSE

This Record of Decision Document (ROD) presents the selected Remedial Action for the Soil Remediation Unit of the Blackwell Zinc Site in Blackwell, Oklahoma. This ROD was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Reauthorization and Amendments Act (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for the site.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF REMEDY

The Site is the former location of the metals smelting facility owned and operated by the Blackwell Zinc Company. The Site is being divided into three operable units in order to allow the soil remediation to proceed independent of the other units.

Soil Remediation Unit

The Soil Remediation Unit addressed in this ROD includes the areas subject to human health risk-based remediation goals. This means that the Soil Remediation Unit deals with soil contamination in residential, recreational, and commercial/industrial areas on the site. The contamination of soil and other media with metals from historical smelting activities from the former Blackwell Zinc facility is the primary concern at the site. The principal threat at the site is that the ingestion of metals contaminated soils poses a potential toxicity concern. The Selected Remedy described in this document for the Soil Remediation Unit addresses the principal threat at the site by reducing or eliminating the exposure of people to elevated levels of metals.

Ecological Remediation Unit

The areas subject to ecological risk-based remediation goals (e.g., grasslands, riparian areas, and streams) are considered part of the Ecological Remediation Unit. The contamination of soil and other

media with metals from historical smelting activities from the former Blackwell Zinc facility is the primary concern at the site. The principal threat at the site from an ecological standpoint is that exposure to metals contamination poses a potential toxicity concern. Because the ecological sampling and data analysis may continue, the results of the ecological analyses will be reported in a separate Ecological Risk Assessment report. Surface water sediments will be discussed to some extent in this ROD but final remedy selection will be deferred until the completion of the Ecological Risk Assessment. The remedy for the Ecological Remediation Unit is not addressed in this ROD but will be specifically addressed in a similar document in the future.

Ground Water Remediation Unit

The ground water contamination will be addressed in the Ground Water Remediation Unit. Additional ground water studies will be conducted to determine the most suitable remedy. Metals contamination from historical smelting activities associated with the former Blackwell Zinc facility is the primary concern related to ground water at the site. The ground water is not used for public or private water supply and thus the ground water contamination is a low level threat. The remedy for the Ground Water Remediation Unit is not addressed in this ROD but will be specifically addressed in a similar document in the future.

MAJOR COMPONENTS OF THE REMEDY FOR THE SOIL REMEDIATION UNIT

- removal of contaminated soil from residential yards and consolidation of that material with other contaminated soils on the former smelter plant location;
- capping of the former smelter plant location; and
- institutional controls to assure the remedy will be maintained properly.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the extent practicable for this Site. However, because treatment of the principal threats of the Site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. No treatment technology exists for metals contaminated soils to remove the principal threat, toxicity. Treatment to reduce mobility of the metals will be conducted where applicable.

Because the remedy will result in hazardous substances remaining onsite above health based levels, a review will be conducted every five years after the commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.



Mark S. Coleman, Executive Director
Oklahoma Department of Environmental Quality



Date

HIGHLIGHTS OF THE SELECTED REMEDY

- This Site is separated into three Remediation Units. This Record of Decision Document (ROD) is for the Soil Remediation Unit, which deals with human health concerns.
- Separate remediation levels are being established for two different land use categories. Category 1 levels apply to residential and recreational areas. Category 2 levels apply to commercial and industrial areas.

Remediation Levels (mg/kg)		
	Category 1	Category 2
Lead	750	2,000
Cadmium	75	200
Arsenic	50	200

- Removal of contaminated soils will be the primary remedy for Category 1 areas. Some tilling or other treatment will also be conducted on residential properties that have concentrations of metals near the remediation levels but which do not exceed them. Contaminated soil will be consolidated and then capped on the former smelter plant property.
- Deep tilling, removal, and/or containment will be conducted on Category 2 areas. Institutional Controls will be established to assure proper present and future land uses for any areas where Category 1 remediation levels are not used.
- The remedy allows for the continued development of the former smelter plant site for commercial or industrial uses.

THE DECISION SUMMARY

SITE LOCATION AND DESCRIPTION

This ROD addresses soil which is contaminated above background levels with the CERCLA hazardous substances lead, cadmium, arsenic, and zinc at the Blackwell Zinc Site (the Site). The Site is located in Blackwell, Oklahoma (Figure 1). This ROD identifies the Remedial Action alternative selected by the Oklahoma Department of Environmental Quality (DEQ).

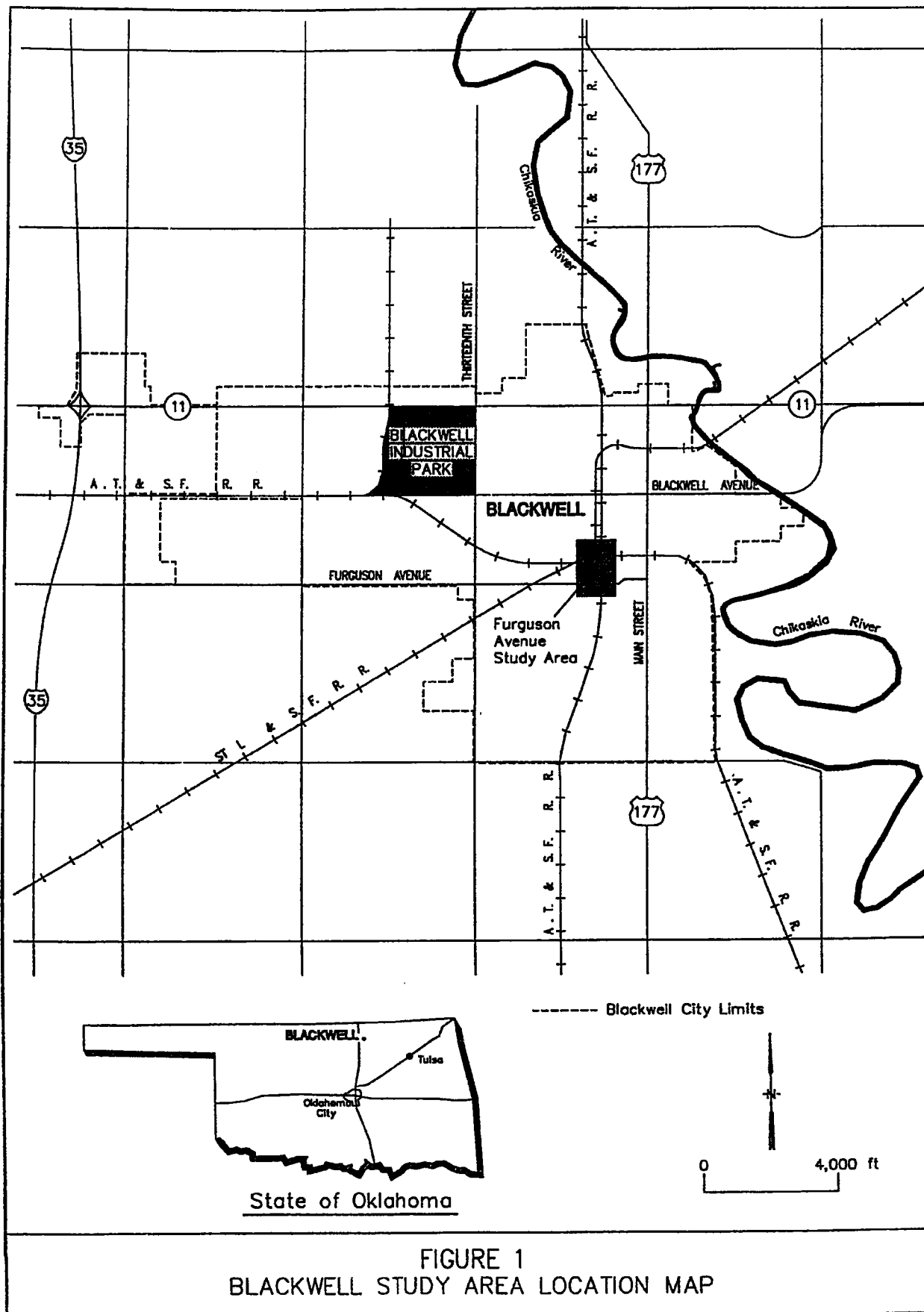
The Blackwell Zinc facility was located on the western edge of the City of Blackwell, Oklahoma (Figure 2). The location of the former Blackwell Zinc facility coincides with the current location of the Blackwell Industrial Authority. The former facility location is now bounded to the north, south and west by a mixture of residential and agricultural use properties. Residential properties border the former facility location to the east. The primary commercial district in the area is along State Highway 11 and near the center of Blackwell approximately 0.5 miles to the east of the former Blackwell Zinc facility.

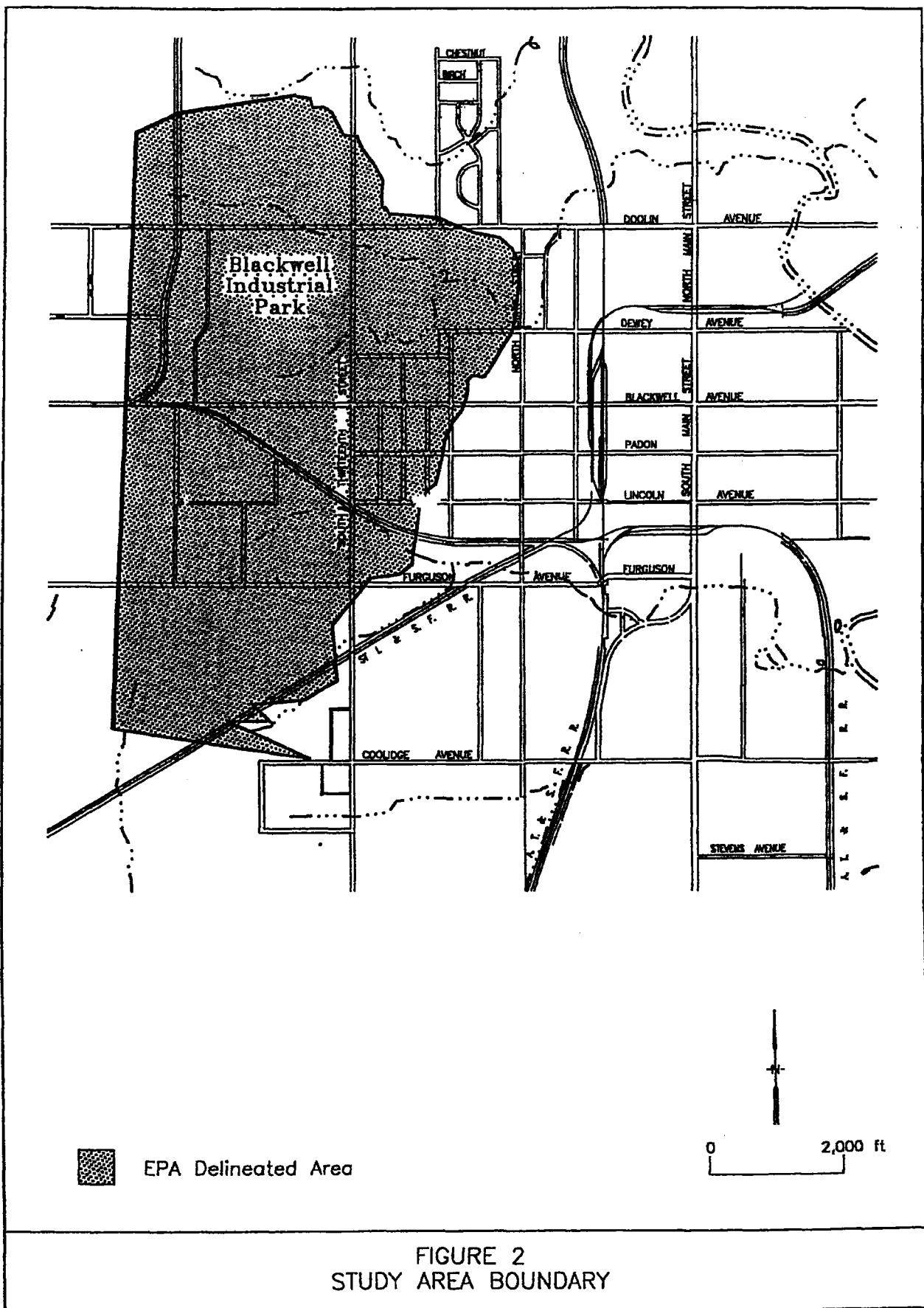
SITE HISTORY AND ENFORCEMENT ACTIVITIES

The plant, a horizontal retort zinc and cadmium smelting facility, operated from approximately 1916 through 1974. Operations at the plant resulted in the release of the CERCLA hazardous substances lead, cadmium, arsenic and zinc into the environment at levels that exceed background concentrations. The surficial soil contamination associated with these hazardous substances from the plant are indicated on Figures 3, 4, and 5. In 1975, the Oklahoma Water Resources Board approved onsite landfilling of residue material on the southern portion of the site. A consent agreement and final order (CAFO) was signed between the Oklahoma State Department of Health and the Blackwell Zinc Company and the Blackwell Industrial Authority in 1992. The purpose of the CAFO was to formalize an agreement by the parties to conduct an investigation of the Site. On July 1, 1993, the newly created DEQ assumed the environmental duties of the Oklahoma State Department of Health. The goal of the CAFO was to assure that an appropriate investigation and remediation of the site was conducted under state oversight in order to protect human health and the environment.

Historical sources of metals at the Blackwell Zinc site include ore concentrates delivered to the facility by rail car, dust from the transport and storage of ore concentrates and solid waste materials at the facility, metals emissions from roasting and smelting processes, airborne particulates from smelting and sintering processes, and various solid waste materials (e.g., retort and sinter residues, slag, crushed retorts, and condenser sands).

In April of 1994, a memorandum of understanding (MOU) was signed between EPA and DEQ to conduct a national pilot project to complete a CERCLA quality investigation and remediation of the Site under the oversight of the DEQ. The Oklahoma Environmental Quality Act gives the DEQ the authority to address the contamination at the Site.





EPA agreed to not make a final determination to list the Site on the National Priorities List (NPL) as long as the pilot project proceeds in a timely manner and achieves CERCLA quality results. DEQ hopes to produce a final remediation that is within the range of actions performed at similar sites across the nation while avoiding some of the more cumbersome aspects typical of the federal process.

The investigation performed by Mintech, Inc., in accordance with the DEQ CAFO, found elevated concentrations of metals in the soil, sediment, ground water, and surface waters in certain areas surrounding the former Blackwell Zinc facility. The metals include lead, cadmium, arsenic, and zinc. Figure 2 shows the study area boundary.

Available data on the blood concentrations of lead in humans (especially children) in Blackwell were also evaluated as an indicator of changes in human exposure to metals. Data indicate that the average blood lead concentration in Blackwell children under 6 years of age (approximately 5.3 ug/dL) is slightly above the range predicted by EPA for 1990 as a baseline national level (4.2 to 5.2 ug/dL). Approximately 3 percent of all children tested in the study in Blackwell had blood lead levels greater than or equal to 10 ug/dL, the concentration set by the U.S. Centers for Disease Control as the indicator for potentially elevated blood lead levels. All of the children with elevated blood lead levels (> 10 ug/dL) were over 6 years of age.

Although the metals, particularly lead and arsenic, may also have other sources not related to the former smelting facility (e.g., lead in paints, automobile emissions, automobile tires, and batteries; arsenic in pesticides), the DEQ believes that a significant portion of the Site was contaminated through historical aerial deposition of metals from the smelting operations and transport of solid materials from the Site.

In addition to the investigations conducted at the Site, removal actions have been conducted at the Beatty-Rodgers Park and the Washington School to address elevated concentrations of metals in soil. Contaminated soils were removed from these locations and taken to the former smelter site to be consolidated with similar materials which will be addressed by this ROD. Excavations at the park and school were filled with clean material and sodded.

Since the facility was closed prior to the implementation of the Resource Conservation and Recovery Act (RCRA), it was never subject to those regulations. The only aspect of RCRA that may have some applicability is that some materials to be addressed by the Selected Remedy may have to be treated to meet the toxicity characteristic for certain metals.

COMMUNITY PARTICIPATION

The involvement of local citizens in this project has been a major goal of both DEQ and EPA. In 1992, a steering committee of local representatives that attempted to include all potentially affected stakeholders in the community was established by DEQ and the City of Blackwell. The steering committee served as a mechanism to voice local concerns directly to the regulatory agencies throughout the project. Public meetings to discuss important developments were advertised in the local newspaper and were held in the evening following steering committee meetings. DEQ and EPA have jointly participated in numerous meetings with the public regarding the project. All significant information has been released through the public meeting process in order to allow concerned local citizens to be the first to receive it.

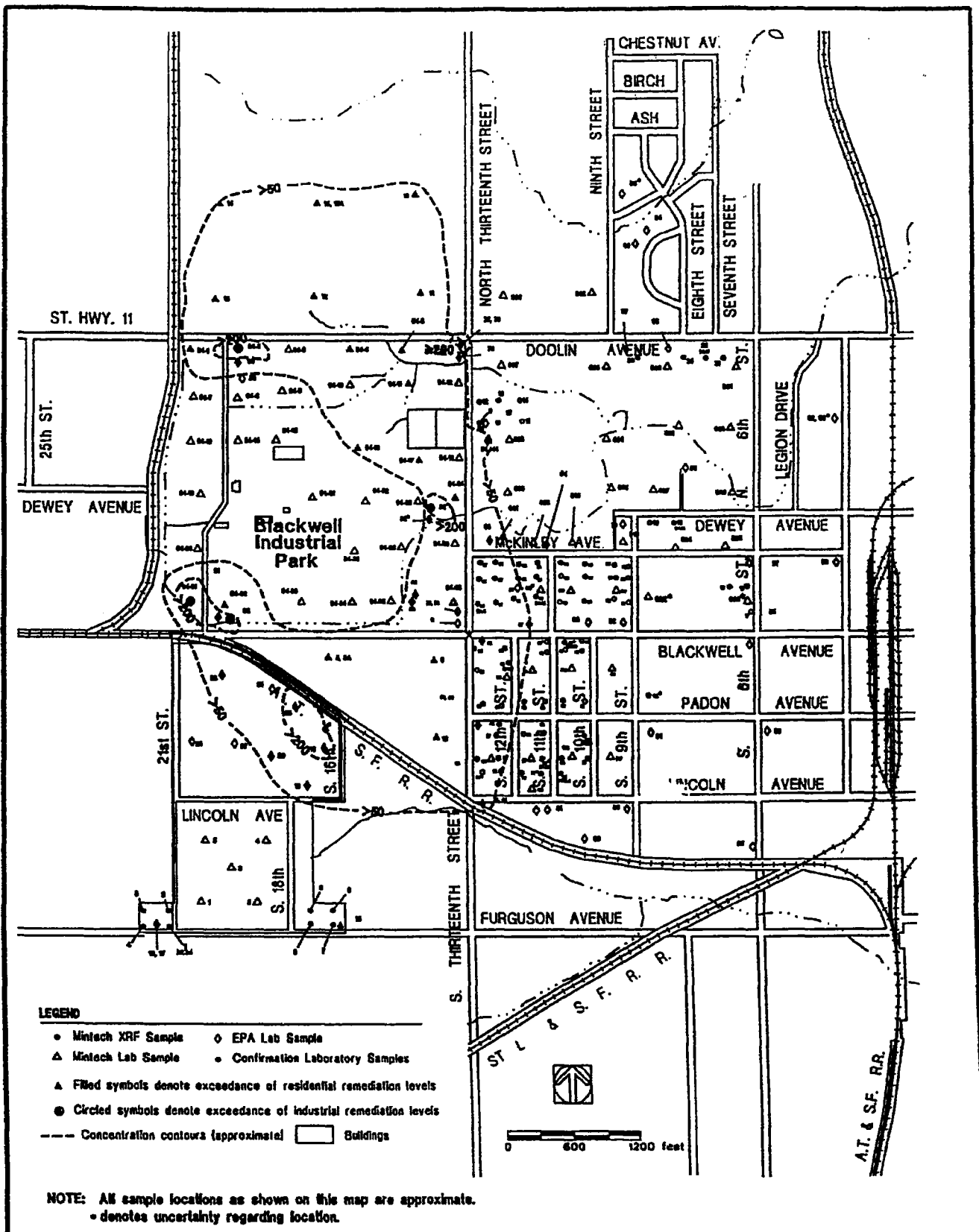


Figure 3. Arsenic surface soil concentrations.

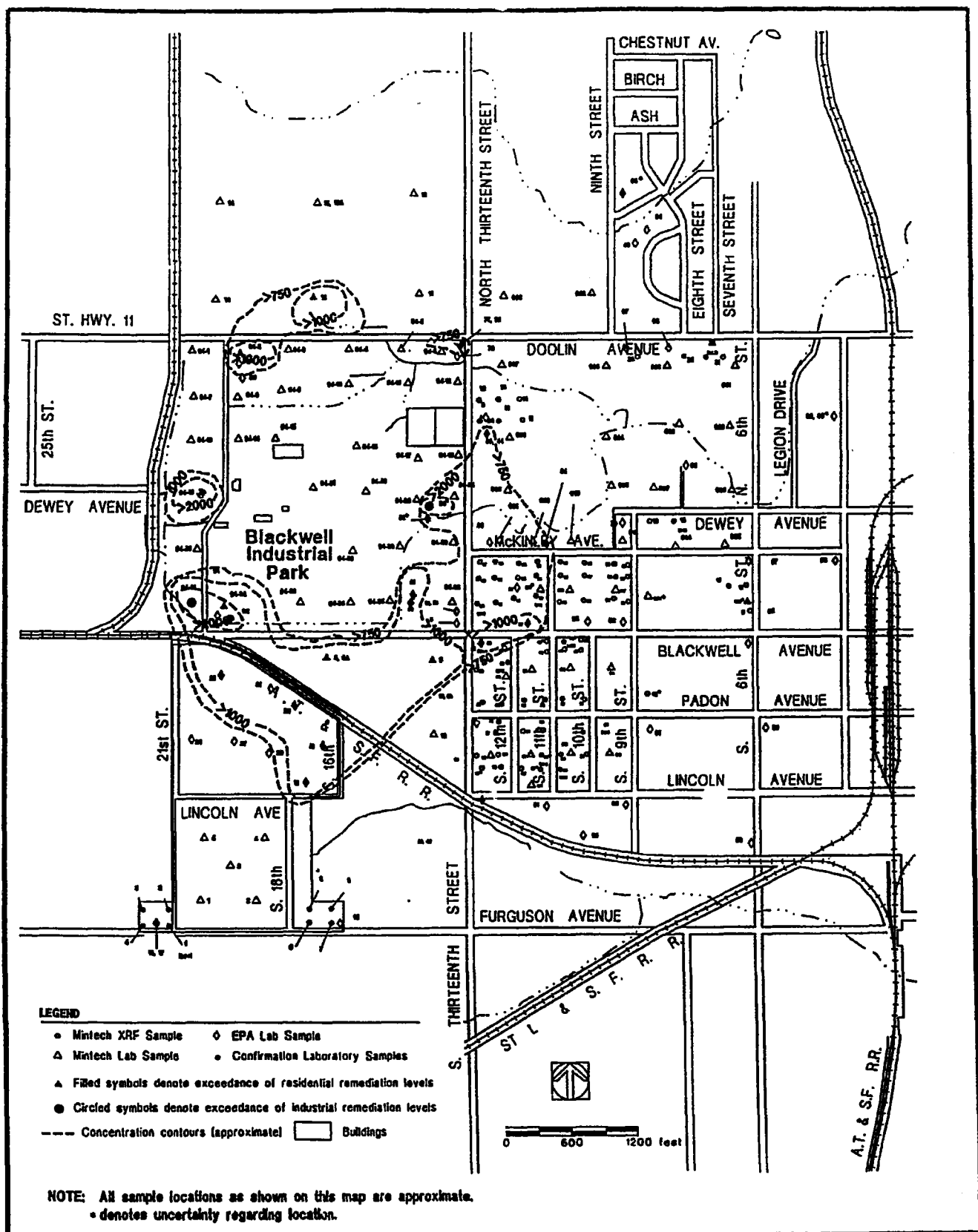


Figure 4. Lead surface soil concentrations.

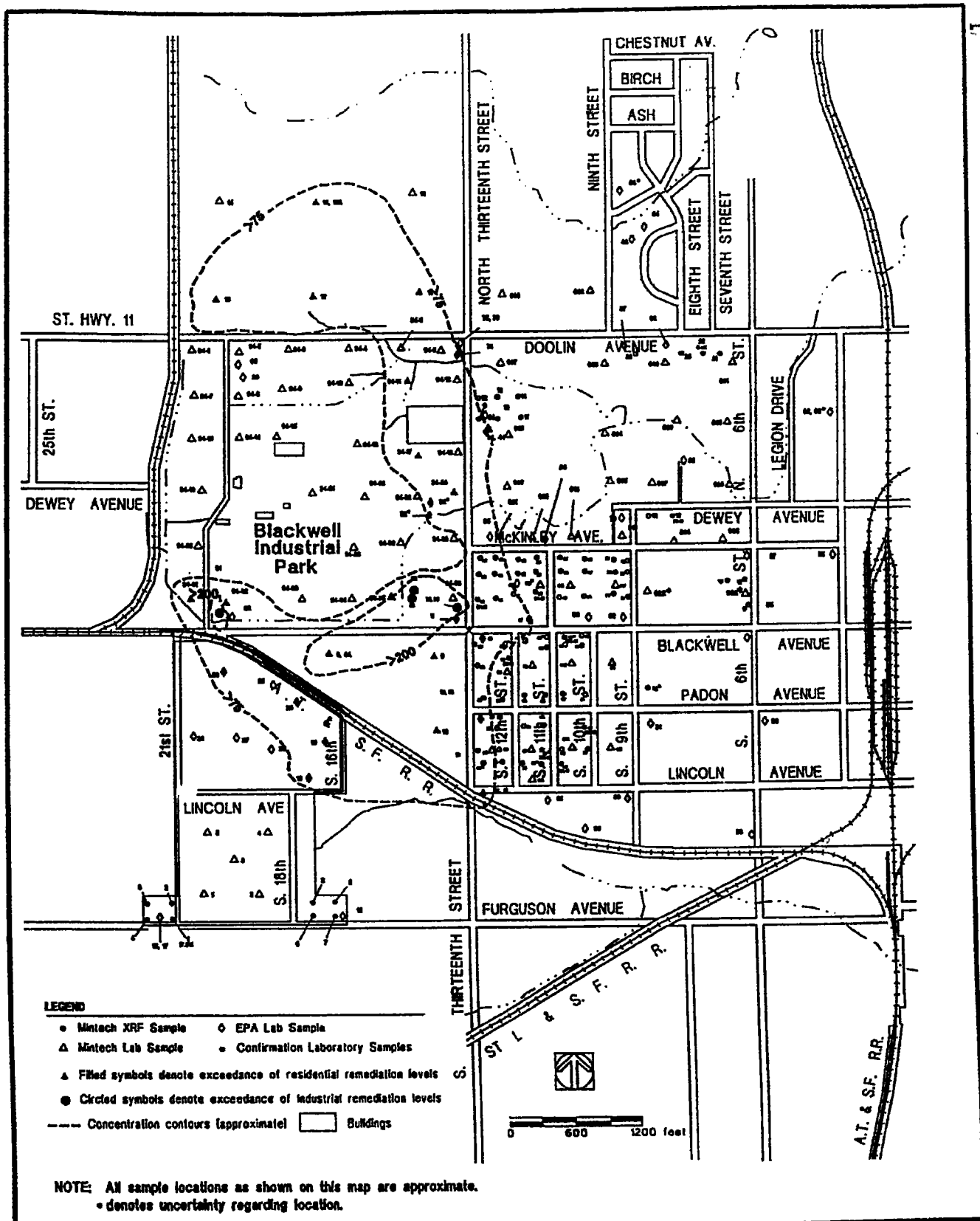


Figure 5. Cadmium surface soil concentrations.

The Proposed Plan was released to the public for review and comment on July 10, 1995, and a public notice was published in the local newspaper. The public comment period for the Proposed Plan was open from July 17, 1995, through September 15, 1995. A public meeting to discuss the Proposed Plan was held on July 20, 1995, in Blackwell. The responses to comments received are included as part of this ROD in the Responsiveness Summary. The administrative record is available at the Blackwell City Hall and at the DEQ office in Oklahoma City, Oklahoma.

SCOPE AND ROLE OF OPERABLE UNIT WITHIN SITE STRATEGY

The Site is being divided into three operable units in order to allow the soil remediation to proceed independent of the other units. The three operable units are called the Soil Remediation Unit, the Ecological Remediation Unit, and the Ground Water Remediation Unit. The Soil Remediation Unit is the focus of this ROD. The other two units will be addressed in similar documents in the future.

Of the environmental media evaluated in the remedial investigation (air, surface water, sediments, ground water, and soil), the primary medium of concern for the protection of human health is soil. Ground water at the Site is of concern but it is not used for drinking water. Irrigation of gardens and lawns has been the only documented use of ground water associated with the Site, thus the ground water contamination is considered a low level threat. Metals concentrations measured in air have not exceeded regulatory limits. Media of potential concern for the Ecological Remediation Unit are soil, surface water and sediment.

The Soil Remediation Unit includes the areas subject to human health risk-based remediation goals. This means that the Soil Remediation Unit deals with soil contamination in residential, recreational, and commercial/industrial areas on the site. The principal threat on the Site is direct contact/ingestion of contaminated soils. The removal of contaminated soils from residential areas and containment of the soils on the former plant site will eliminate the principal threat related to the Site.

The remedial action objectives for the Soil Remediation Unit are intended to:

- prevent ingestion of soil/dust lead originating from historical smelting operations at the Site that would result in a greater than 5 percent probability of an individual child or pregnant female having a blood lead concentration greater than 10 ug/dL;
- prevent ingestion/direct contact with cadmium soil or dust originating from historical smelting operations at the Site in excess of the reference dose, which accounts for typical daily intake from food and other background sources; and
- prevent ingestion of arsenic in soil or dust originating from historical smelting operations at the Site in amounts that pose an excess cancer risk.

SUMMARY OF SITE CHARACTERISTICS

The remedial investigation revealed that soil contamination by lead, cadmium, arsenic, and zinc is present on portions of the Site. The historical smelting operations at the Blackwell Zinc Plant appear to be a significant source of the elevated levels of metals in soil, groundwater, and surface water sediments. Airborne emissions from the historical smelting operations are responsible for dispersal of lead, cadmium, arsenic and zinc across portions of the Site. Solid waste materials from the smelter have also been physically moved to areas within the site boundaries for use as

fill or for other purposes. These metals have low mobility in soil and there is no evidence that suggests significant migration of metals in soil is currently occurring. Some migration of metals is still occurring through surface water runoff into the stormwater drainage on the site.

The concentration ranges of metals that were detected in Site soils are listed below:

Lead	<2.37	to	28,000	milligrams/kilogram (mg/kg)
Cadmium	"not detected"	to	2,210	mg/kg
Arsenic	"not detected"	to	1,160	mg/kg
Zinc	12.8	to	102,000	mg/kg

The higher concentrations of metals in soils have all been detected on the former smelter plant property and are primarily associated with solid wastes that remain. Concentrations of metals decrease significantly within a relatively short distance from the former facility boundary. The only residential areas that are significantly impacted are immediately to the east, southeast and south of the former facility. Within one half mile from the former facility boundary, metals concentrations have generally decreased to below the selected remediation levels. See figures 3, 4, and 5 for a delineation of the extent of contaminated soils identified by the investigation of the Site.

Ground water has also been impacted by metals. Cadmium and zinc are the primary contaminants of concern with regard to the ground water. A plume of contaminated ground water has been identified to the southeast of the former smelter plant location. The plume ends near Furguson Avenue midway between Main Street and Sixth Street. Ground water is discharging to a small stream at that point but the elevated metals are being trapped in the soil and have not been detected in the stream. Further ground water studies are planned in the Ground Water Remediation Unit to determine the extent and nature of remediation that may be required.

The only surface water body that has been shown to be impacted is the unnamed tributary which flows eastward from the former smelter facility through Legion Park to the Chikaskia River. The sediments of the tributary have elevated concentrations of metals for some distance from the former facility boundary. The concentrations of metals in the sediments entering Legion Park exceed the remediation levels for recreational areas identified in this ROD. Near the confluence of the stream with the Chikaskia River the levels of metals have decreased significantly. More studies of surface water and sediment impact will be conducted for the Ecological Remediation Unit to determine the nature and extent of remediation that may be required.

Historical air emissions from the smelter are believed to have played a role the distribution of metals across the site. However, in recent air monitoring events, no elevated levels of metals have been detected.

SUMMARY OF SITE RISKS TO HUMAN HEALTH

The primary risk associated with the Site is related to ingestion of and/or direct contact with contaminated soils. Children from the ages of six months to six years are the most susceptible to metals contamination in the soil, because they tend, through play and other activities, to ingest soil. Exposure to lead in the concentration ranges found on portions of the Site can cause

developmental problems in this age group. These developmental problems may contribute to conditions such as learning disabilities, attention deficit disorder, and hearing impairment.

Exposures to cadmium are of concern because cadmium has a tendency to accumulate in the body. As it accumulates, there may be damage to the kidneys and development of hypertension. There are also data which suggest inhalation of cadmium may be associated with development of certain kinds of cancer. Air monitoring at this site has not indicated any significant levels of cadmium in ambient air. Therefore, no exposure pathway presently exists at the site relative to carcinogenic risk.

Arsenic is also a contaminant of concern at this Site. Levels of arsenic found at this site are high enough to be of concern for children who ingest substantial amounts of soil. Action levels for arsenic will be set at this site to ensure that isolated areas of elevated arsenic found in association with the other compounds of concern will be addressed. Chronic oral exposure to arsenic can produce thickening of the skin on the palms and soles along with a pale skin color. Skin cancers have been reported among some people exposed to arsenic compounds. Chronic exposure to arsenic may also result in impaired formation of red blood cells and in liver damage.

Zinc at this site is not considered a significant threat to human health but is of potential concern for ecologically sensitive areas. Zinc contamination will therefore be addressed specifically in the Ecological Remediation Unit. At that time, action levels may be set to protect ecological receptors based on the results of the ecological risk assessment, which is currently underway. During cleanup of the Soil Remediation Unit, zinc contamination will be addressed concurrently with lead and/or cadmium since areas of higher concentrations of zinc coincide with areas that exceed the action levels for lead and cadmium.

DESCRIPTION OF SOIL REMEDIATION UNIT ALTERNATIVES

No Action Alternative

The No Action Alternative is the baseline to which all other alternatives are compared. In this alternative, conditions at the Site would remain as they existed prior to the implementation of any actions. The assumption is made that no past, present, or future consolidation or remedial actions will be performed.

No Further Action Alternative

The No Action Further Action Alternative includes all actions conducted at the Site through 1994.

Institutional Controls Alternative

The Institutional Controls Alternative includes legal, physical, and administrative actions to reduce potential exposure at the Site. Zoning restrictions may be used to limit uses of industrial, commercial, and recreational properties. Fencing may be installed around industrial or commercial properties, where appropriate, to limit access. Construction limitations for local activities may be instituted on a community-wide basis for dust control and solids management during construction activities.

Education may be used to reduce exposure potential through increased public awareness of the need for preventing the uptake of metals into plants by adjusting garden soil pH with lime applications, establishing and maintaining proper vegetative cover in yards and using other

personal health and hygiene practices to reduce ingestion and inhalation of soil and dust. Public education programs could include meetings, brochures, newscasts, and newspaper articles.

Containment Alternative

The Containment Alternative would reduce the exposure potential by limiting physical contact with the soil. Containment includes capping and surface controls. The ground surface may be covered with a clay/soil, asphalt, or concrete cap or with a synthetic material to act as a barrier. However, synthetic materials such as flexible high density polyethylene (HDPE) or polyvinyl chloride (PVC) may not be practical for use in residential or high use areas.

Diversion/collection processes can be used to manage surface water runoff and to reduce infiltration. Grading may be used to modify surface topography to manage runoff. Soil stabilization by chemical and physical modification of the soil can also be used to minimize infiltration. However, soil stabilization may not be suitable in all areas because the physical change in the soil impairs vegetative growth. Revegetation by reseeding or sodding may be used to create or enhance an existing surface barrier to reduce physical contact.

Removal Alternative

The Removal Alternative would reduce the exposure potential through excavation and consolidation or disposal of soil and other solids. Standard construction equipment would be used to remove soil to a predetermined depth.

Removal to a specified maximum depth would reduce the exposure potential to soil to an acceptable level. Activities such as construction that would expose soil below a specified maximum depth of removal would be infrequent and limited, and the increased exposure potential would be negligible.

Following excavation, additional soil samples would be collected from the base of the excavation and submitted for chemical analysis to determine whether the remediation goals have been met. If required, additional soil would be removed. If action objectives have not been met at the specified minimum depth, a permeable synthetic membrane could be placed on the bottom of the excavated area prior to backfilling. The membrane would act as a barrier to reduce the exposure potential. All excavated areas would then be backfilled with clean soil to grade. Vegetation or surfacing in the excavated areas would be restored. The clean soil, vegetation, and/or surfacing would act as a barrier to reduce the exposure potential.

Representative samples of excavated soil and other solids would be submitted for laboratory analysis using Toxicity Characteristic Leachate Procedure (TCLP) to characterize the material. If the material were characterized as "hazardous" by definition, it would be transported to a permitted, Subtitle C landfill for disposal or be treated to render it non-hazardous. Similar materials excavated at other sites in Oklahoma and Texas have been shown to generally be non-hazardous for disposal purposes. Dust control measures would be implemented at all stages of transport and disposal. Proper state permits for transport and disposal would be secured prior to disposal activities.

In the **Removal/Consolidation Process Option**, described in Blackwell Technical Report 95-12, excavated soil would be transported to the Blackwell Industrial Park. Dust control measures would be implemented at all stages of transport and consolidation. The consolidated soil would

be capped and would permanently remain in a residue cell located on the Blackwell Industrial Park property.

The **Removal/Disposal Process Option**, described in Blackwell Technical Report 95-12, represents an offsite disposal option for excavated soils. It would reduce the exposure potential through transport and disposal of excavated soil and other solids at a facility permitted to accept these materials.

Treatment Alternative

The Treatment Alternative includes in-situ, ex-situ, and thermal remediation technology to reduce the exposure potential at the Site. Process options for in-situ treatment include mixing/deep tilling, bioremediation, and phosphate amendments. Bioremediation uses microorganisms to degrade organic contaminants, and is not applicable for the Blackwell site. The bioorganisms used are not effective for inorganic metal contaminants. Options for ex-situ treatment include soil washing, acid extraction, and stabilization/solidification with consolidation. Soil washing uses water or solvents to remove and concentrate elements, and acid extraction uses acids to remove and concentrate elements. The cost of soil washing and acid extraction is very high and the effectiveness is not proven.

Options for thermal treatment include incineration, pyrolysis, and vitrification. Incineration utilizes burning of materials to destroy contaminants, and pyrolysis utilizes heat to chemically change contaminants. Incineration and pyrolysis are not generally applicable for metals. Vitrification induces an electrical current to melt contaminants into a stable, glass-like material in-situ. Vitrification is not applicable for residential and other existing land uses at the Site.

Mixing/deep tilling would use rototilling or deep tilling in a sufficient number of passes with standard equipment to reduce surface concentrations of metals. The ground surface would be restored following the mixing/deep tilling activities. Following mixing/deep tilling, additional soil samples would be collected and submitted for chemical analysis to determine whether the remediation goals have been met. If required, additional remediation activities would be performed.

Phosphate amendments to soil are intended to reduce the bioavailability of the metals. Research on phosphate utilization to reduce metal bioavailability is being conducted on a national level. The use of phosphate amendments remains a potential action alternative, especially in areas of low to moderate metal concentrations.

A representative methodology for the phosphate amendment process option would use standard equipment to spread triple superphosphate on the ground surface at an application rate of about 20 pounds per cubic yard of soil. The amendment would be mixed with the soil as previously discussed, and the ground surface would be restored.

Ex-situ stabilization/solidification with consolidation would, when necessary, use chemical stabilizing agents to reduce mobility of metals and for controlled management of solids. Standard construction equipment would be used to remove soil above remediation goals to a predetermined depth. The depth of excavation would not exceed the maximum depth specified in the work plan, as previously discussed in the Removal Alternative section. Dust control measures would be implemented at all stages of excavation and stabilization.

Following excavation, additional soil samples would be collected from the excavated area and submitted for chemical analysis to determine whether the remediation levels have been met. If required, additional soil would be removed to the specified maximum depth. A permeable synthetic membrane could be placed on the bottom of the excavated area prior to backfilling. The membrane would act as a barrier to reduce the exposure potential.

If necessary, the excavated soil would be stabilized in bulk using chemical amendments, as discussed in the previous in-situ treatment section, or other suitable amendments. Samples of the stabilized soil would be submitted for laboratory analysis to verify the effectiveness in reducing mobility and bioavailability and to confirm that the remediation levels have been met. All excavated areas would be backfilled to grade with the stabilized soil. Vegetation or surfacing in the excavated areas would be restored. The stabilized soil, vegetation, and/or surfacing would act as a barrier to reduce the exposure potential.

DEQ's Preferred Alternative

DEQ's preferred alternative was first presented in the Proposed Plan and was developed by combining aspects of some of the other alternatives identified in Blackwell Technical Report 95-12.

DEQ's preferred alternative calls for the establishment of two land use categories. Category 1 is comprised of residential and recreational lands. Category 2 is comprised of commercial and industrial lands. Separate remediation levels will be set for Category 1 and Category 2 lands.

Removal of contaminated soils will be conducted in Category 1 areas. Tilling, removal and/or containment will be conducted in Category 2 areas. Any soil removed from Category 1 or 2 areas will be consolidated onto the former smelter plant property. Contaminated portions of the former smelter plant property will then be covered with a cap. House dust abatement will also be conducted in affected residential areas following removal of contaminated soils.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The Soil Remedial Action Alternatives were compared with seven Evaluation Criteria:

- Overall Protection of Human Health and the Environment
- Compliance with Applicable or Relevant and Appropriate Regulations (ARARs)
- Cost
- Long term Effectiveness and Permanence; Short term Effectiveness
- Reduction of Toxicity, Mobility, and Volume Through Treatment
- Implementability.

These criteria as well as two additional criteria, Community Acceptance and State/Federal Acceptance, are defined in Table 1. This augments the secondary technology screening conducted as part of the evaluation process. Supporting information is presented in the Data Report.

EVALUATION OF ACTION ALTERNATIVES FOR SOILS

Overall Protection of Human Health and the Environment

The No Action Alternative would not reduce the exposure potential. The No Further Action Alternative would not reduce the exposure potential further than that already achieved by previous consolidation activities.

Institutional Controls would reduce the exposure potential, but would require coordination with landowners and local government, provisions for enforcement, continuation for a long period, and are not practical for residential areas as the sole remedy.

Containment by the various capping process options which includes the construction of building foundations and roadways, would effectively reduce the exposure potential in suitable areas. Capping may be limited to the former plant sub-area. Containment by the surface control options (diversion, grading, and revegetation) may not reduce the exposure potential, but may be applicable as an additional safeguard in areas of low to moderate metals concentrations in soil.

Removal with consolidation or disposal actions would reduce the exposure potential by totally eliminating the potential for contact. Treatment with amendments would also reduce the exposure potential.

The DEQ Preferred Alternative would effectively reduce the exposure potential by using a combination of the other alternatives. The DEQ proposed remediation levels for the Soil Remediation Unit meet the goals of residual risks being within accepted guidelines commonly used in the Superfund Program. The carcinogenic risk from arsenic at the residential remediation level is 3 in 100,000. Risks greater than 1 in 10,000 are considered unacceptable for carcinogenic compounds. The noncarcinogenic risk associated with the cadmium residential remediation level is below a hazard index of 1.0. For noncarcinogenic risks a hazard index greater than 1.0 is considered unacceptable. Lead is evaluated uniquely by using a model which was designed specifically for that compound and is intended to be protective of children in residential settings. The lead residential remediation level was calculated using this model which is called the Integrated Exposure Uptake Biokinetic Model for Lead in Children. The Commercial/Industrial remediation levels were calculated based on occupational exposure scenarios.

Compliance with ARARs

The No Action and No Further Action Alternatives do not meet ARARs. All of the remedial "Action" Alternatives discussed would essentially be comparable and meet the criteria for compliance with ARARs. The exception is that the Containment alternative and the DEQ Preferred Alternative would be more protective of ground water by limiting infiltration of precipitation. Additional evaluation and monitoring will be necessary for soil removal, offsite disposal, and/or treatment activities to ensure compliance with RCRA and DEQ disposal regulations. Since the facility was closed prior to the implementation of the RCRA, it was never subject to those regulations. The only aspect of RCRA that may have some applicability is that some materials may have to be treated to meet the toxicity characteristic for certain metals.

Cost

The No Action Alternative would result in no cost, while the No Further Action Alternative would result in no additional cost. Institutional Controls are the lowest cost of all other Action Alternatives.

A clay/soil cap is the lowest cost process option for capping as a Containment Alternative. An asphalt cap is a moderate cost process option for Containment, and a concrete cap is the highest cost option for Containment, but may be cost effective in areas where industrial development is intended.

Grading and revegetation are the lowest cost process options for surface control as a Containment Alternative. Diversion/collection is a moderate cost means for Containment by surface control but is only applicable in certain areas. Removal by excavation with consolidation onsite is a moderate to high cost Alternative. Removal by excavation with offsite Disposal is a very high cost alternative. In-situ Treatment by mixing/deep tilling and phosphate amendments are moderate cost Alternatives. Ex-situ Treatment by stabilization/ solidification with consolidation is a moderate to high cost Alternative.

The DEQ Preferred Alternative is moderate to high cost. Action Alternative cost estimates are detailed in the Data Report.

Costs for Soil Remediation Alternatives

No Further Action	\$ 0
Institutional Controls	\$ 397,000
Containment Options	\$1,100,000 to \$3,862,000
Removal Options	\$1,939,000 to \$5,016,000
Treatment Options	\$ 209,000 to \$2,148,000
DEQ Preferred Alternative	\$3,400,000

Long Term Effectiveness and Permanence

The No Action Alternative may become effective and permanent over time but would not meet the overall action objectives. The No Further Action Alternatives may also become effective and permanent over time but would be only partially effective in reducing exposure potential.

Institutional Controls would require constant enforcement to maintain effectiveness and permanence in the long term. Deed restrictions or notifications may not be effective for residential areas.

The Containment Alternative by capping would result in long term effectiveness and permanence with a minimum of maintenance, while surface controls would require a greater level of maintenance.

The Removal Alternative would result in the most effective and permanent remediation in the long term, but effective and permanent offsite disposal or onsite consolidation of the removed solids would also be necessary. In-situ Treatment by mixing/deep tilling would result in effective and permanent remediation of surface soil with proper long term management. The effectiveness and permanence of in-situ Treatment using phosphate or other amendments, an innovative

technology, would require laboratory and/or field testing. The ex-situ Treatment Alternative would result in a very effective and permanent long term remediation.

The DEQ Preferred Alternative would be effective and permanent in the long term.

Short Term Effectiveness

Implementation of the No Action, No Further Action, and Institutional Control Alternatives would result in no additional short term risk to the community, workers, or the environment during remedial actions.

Containment Alternatives by capping would result in no risk to the community and would result in no environmental impacts during remedial actions. Containment by surface controls could increase exposure potential to the community, workers, and the environment from dust and runoff without proper controls. Risks to workers during implementation of Containment would be safety concerns associated with operation of construction equipment.

Removal with Consolidation or Disposal Alternatives could increase exposure potential for the community, workers, and the environment from dust and runoff without proper controls. Risks to workers and to the community during implementation of Containment would be traffic and safety concerns associated with operation of construction equipment.

The DEQ Preferred Alternative would be comparable to the Treatment, Removal, and Containment options for short term risks. This is because it involves elements of each.

Treatment Alternatives could increase exposure potential for the community, workers, and the environment from dust, air quality, and runoff without proper controls. Risks to workers during implementation of Treatment would be safety concerns associated with operation of construction, mixing, and tilling equipment, and usage of chemicals for amendments and stabilization.

The No Action, No Further Action, and Institutional Control Alternatives could be implemented in less time than the other Alternatives. In-situ Treatment options would require about one-half the time required to implement the Containment, Removal, offsite Disposal, and ex-situ Treatment and DEQ Preferred Alternatives.

Reduction of Toxicity, Mobility, and Volume Through Treatment

The in-situ and ex-situ Treatment Alternatives would reduce toxicity and mobility. Ex-situ treatment alternatives may result in an increase in overall volume due to the addition of treatment materials. None of the other Alternatives addressed would result in reduction of toxicity, mobility, or volume.

Implementability

The No Action Alternative may not be acceptable to the public and/or the local, state, and federal governments. The No Further Action Alternative is easily implementable because some consolidation activities have already been completed.

Deed restrictions or notifications are moderately easy to implement but require coordination with landowners and local government and may not be effective for residential areas. Fencing is easily implemented for commercial and recreational areas but is not practical for residential areas.

Construction limitations are easily implemented but require provisions for enforcement. Community education could be easily implemented but requires continuation for a long period to be effective.

The Containment Alternatives are easily implemented but drainage control may need to be implemented for clay/soil caps. In addition, asphalt or concrete caps and diversion and grading require suitable areas.

Removal is easily implementable in some areas and impractical in others. Removal with offsite disposal is only moderately implementable due to the distance of transportation required to permitted, regulated landfills.

In-situ Treatment by mixing/deep tilling is moderately implementable but requires a variety of equipment and may be limited in residential areas due to the equipment size and available work area. Chemical Amendment options are easily implemented.

Ex-situ Treatment is moderately implementable but may require mobilization of specialized equipment.

The various aspects of the DEQ Preferred Alternative are easily to moderately implementable.

ADDITIONAL CRITERIA TO BE CONSIDERED BY DEQ

Community Acceptance

The acceptance of the preferred alternative and/or other alternatives by the Blackwell Community was evaluated through the public participation process and any comments received during the formal public comment period. The Responsiveness Summary portion of this document includes a summary of the comments received by DEQ and the responses to those comments. Although some specific concerns relative to the remediation of the site were identified through the public comment process, we believe that the local community generally supports the Selected Remedy.

State/Federal Acceptance

State acceptance is typically a criterion used in the Superfund process. However, because the project is being led by a state agency, federal acceptance was evaluated in lieu of state acceptance. Federal acceptance was evaluated based on comments received during the formal public comment period from EPA.

THE SELECTED REMEDY

DEQ's preferred alternative for the Soil Remediation Unit was originally presented in the Proposed Plan and is the selected remedy. The DEQ selected remedy for the Site combines aspects of some of the alternatives presented in the Blackwell Technical Report 95-12. The report entitled Blackwell Technical Report 95-12 serves as the summary report of the remedial investigation and feasibility study activities. Much of the information in the report is summarized from eleven previous reports which detail individual phases of the remedial site investigation. DEQ has selected a remedy for the Soil Remediation Unit of the site based on the type of land use category-

ry. Specific remedies and remedial action goals or cleanup levels are set for each category. The two land use categories are:

- (1) Residential and Recreational Lands
- (2) Commercial and Industrial Lands

Category 1 Residential and Recreational Lands

DEQ will consider any properties that are either zoned as and/or used for residential purposes as Category 1. DEQ is requiring that for these types of properties the Removal Alternative be employed. Soil exceeding the final remediation levels shall be excavated from these types of properties and shall be returned to the former smelter plant property to be staged, treated if it exceeds the criteria for the toxicity characteristic leachate procedure, and consolidated with similar materials as in the Removal/Containment Process Option. Removal shall be to a maximum depth of two feet below grade. Additionally, DEQ is requiring that house dust abatement procedures be applied to residential homes in the area. The house dust abatement will include vacuuming with high efficiency vacuum cleaners and appropriate handling and disposal of collected house dust. House dust abatement is to be instituted after soil remediation is complete in a given area. Also containment (capping) of areas such as driveways in residential areas with asphalt or some other suitable material shall be allowed in lieu of removal upon specific approval by DEQ. Institutional Controls shall be required to insure continued maintenance of the selected remedy. They shall also insure that activities such as utility repair on the site will be conducted in a manner protective of the remediated areas. Mixing/deep tilling of soils or fertilization to improve vegetative cover on properties that do not exceed remediation levels will be allowed by DEQ. However, DEQ does not endorse the use of triple-superphosphate at this time.

The DEQ requires the following remediation levels for Category 1 properties:

Lead	750 mg/kg
Cadmium	75 mg/kg
Arsenic	50 mg/kg

Category 2 Commercial and Industrial Lands

DEQ will consider any property zoned as and used for commercial or industrial purposes as Category 2. Institutional Controls will be required in order to utilize the remediation levels that are being required for Category 2. Institutional controls shall assure that Category 2 areas which exceed the remedial action goals that are applied to Category 1 lands are not used for residential purposes in the future. If it is determined that the institutional controls cannot be adequately instituted or are not adequately protective then Category 1 remediation levels shall be applicable to all of the Soil Remediation Unit. The remediation levels required for Category 2 are:

Lead	2000 mg/kg
Cadmium	200 mg/kg
Arsenic	200 mg/kg

The approach for Category 2 areas is to utilize the Containment Alternative to manage wastes on the former smelter plant property by capping. The cap shall be designed to provide a barrier which will be protective of direct contact hazards. Additional capping requirements may be established in the ROD for the Groundwater Remediation Unit to reduce infiltration of water and

preclude leachate formation. Specific criteria for the cap will be determined by DEQ during the Remedial Design for the Soil Remediation Unit. In order to be protective of direct contact hazards in the Soil Remediation Unit, the cap will be required to be eighteen inches in thickness. The permeability criteria will not be established until after the Groundwater Remediation Unit remedial investigation and feasibility study is completed. This thickness may be reduced at the discretion of DEQ for areas that are capped with concrete or asphalt rather than soil. Additional sampling of the upper two feet of the former Blackwell Zinc facility property will be conducted during the Remedial Design for the Soil Remediation Unit. This is necessary in order to better define the size and exact location of the cap. Institutional controls will be established to insure that cap integrity is maintained and that any onsite construction or excavation activities are properly managed. The storm drainage through the site shall also be capped. DEQ will consider options during the Remedial Design to substitute concrete, asphalt, or other materials for standard capping materials in order to facilitate the future development of the industrial park. Streets, building pads, or parking lots could be designed as components of the cap. This approach is in line with the U.S. Environmental Protection Agency's new Brownfields program which encourages the "recycling" of former industrial facilities. One of the intended effects of the Brownfields program is to reduce the need to develop "greenfields" that have not previously been used for industrial purposes. Buffer zones, which will be applicable to those portions of Category 2 areas that border Category 1 areas, shall be established as part of the Remedial Design. Within the buffer zone, the Category 1 standards will be met.

In the undeveloped areas outside the former plant area, deep tilling shall be conducted if it is proven to be effective on a pilot scale. If tilling of an area is unsuccessful, then removal and/or containment shall be required.

As the Remedial Design and Remedial Action progress, areas where smelter residues were transported and remain exposed or have insufficient cover will be identified. Specific steps to be taken to identify smelter residues that remain exposed or have insufficient cover shall be included in the Remedial Design for the Soil Remediation Unit. Such steps shall include solicitation of information from the public. Any areas that are identified as containing smelter residues shall be evaluated to determine whether they continue to pose a significant hazard. If such areas are identified, then they shall be addressed as part of the Soil Remediation Unit in a manner that will eliminate or reduce the potential for exposure to an acceptable level. Case by case decisions will be made regarding whether these situations will be handled as Category 1 or Category 2 areas.

Institutional Controls

It will be necessary to implement institutional controls for both Category 1 and Category 2 remedies. An Institutional Controls Plan shall be developed during the Remedial Design. Institutional Controls are non-engineered measures taken to control, limit, or manage future activities or risks in support of a remedial action. The purpose for using institutional controls at the Blackwell Zinc Site is to insure that future activities are adequately controlled in areas where any soils contaminated above the residential remediation levels remain. The following institutional controls will be established:

Install security fences and post signs around commercial or industrial properties, as appropriate, to limit access;

In conjunction with the City of Blackwell and if appropriate Kay County, develop a system for establishing zoning or other restrictions for non-residential properties that exceed the residential remediation levels;

Develop a system for the City to use its current authorities to require protective soil management and dust control procedures during construction activities, as well as develop a system which addresses continued maintenance of capped areas; and

Establish a public education program to inform and educate the public, particularly parents and children, on ways to reduce potential exposure to lead, cadmium, and arsenic.

THE STATUTORY DETERMINATIONS

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy for the Soil Remediation Unit will be effective in eliminating, reducing and controlling risks to public health from contaminated soils. The selected remedy will achieve these goals through a combination of the removal of contaminated soils, the use of engineering controls, the use of institutional controls, and where appropriate, the treatment of contaminated soils. The remediation levels that will be used are sufficiently protective of human health and fall within the range of such standards established at similar sites across the nation.

Any potential cross-media impacts that might occur as a result of the implementation of the selected remedy can readily be controlled through standard air monitoring and engineering controls. The selected remedy calls for air monitoring to be conducted throughout construction activities and for dust control measures to be implemented as necessary. No unacceptable short-term risks are anticipated as a result of the implementation of the selected remedy.

The proposed remediation levels for the Soil Remediation Unit meet the goals of residual risks being within accepted guidelines commonly used in the Superfund Program. The carcinogenic risk from arsenic at the residential remediation level is 3 in 100,000. The noncarcinogenic risk associated with the cadmium residential remediation level is below a hazard index of 1.0. The lead residential remediation level was calculated using a model called the Integrated Exposure Uptake Biokinetic Model for Lead in Children which is specifically designed for that purpose. The Commercial/Industrial remediation levels were calculated based on occupational exposure scenarios.

COMPLIANCE WITH ARARs

The selected remedy will comply with the ARARs listed in Table 2. Treatment of the toxicity characteristic will be conducted on material subject to the Resource Conservation and Recovery Act, Subtitle C. However, this is only applicable to materials that are excavated and moved onto the former smelter plant facility. Some of the Oklahoma Solid Waste Management Regulations are considered relevant and appropriate since the selected remedy will be similar in nature to the capping and closure of a solid waste landfill. The fact that this remedy will be conducted under an order from the DEQ will not exempt the potentially responsible parties from compliance with any legally applicable regulations such as the Clean Air Act or the regulations of the Occupational Safety and Health Administration.

COST-EFFECTIVENESS

The selected remedy is currently estimated to cost 3.4 million dollars. This estimate will be revised in the Remedial Design. Because the selected remedy allows for the use of differing remediation levels based upon land usage, it is more cost-effective than a remedy that applies only one set of remediation levels to the entire site. Further, excavation will only be required as the primary remediation technique in residential areas. The dimensions of the cap to be constructed will be determined in the Remedial Design rather than in this ROD to allow further evaluation of how to consolidate contaminated materials in order to minimize the area that will require capping. Unlike past remedies for similar sites, the selected remedy also allows for flexibility in the type of cap to be constructed in order to encourage the future use of the property. This opportunity to allow the property to retain its commercial value adds to the costeffectiveness of the selected remedy.

UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The chemicals of concern are metals that cannot be destroyed. Permanence of remedial alternatives must be judged in terms of the elimination of exposure to these compounds. Removal of contaminated soils from residential areas is the most permanent solution possible in terms of the elimination of the potential for exposure. The selected remedy allows for the use of treatment by stabilization for any excavated materials moved onto the former smelter plant that fail the criteria of the toxicity characteristic leachate procedure (TCLP). Resource recovery of the metals from the soil for use as product is not economically feasible with current technologies.

PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The preference for treatment as a principal element is not satisfied by this ROD. As mentioned in the previous paragraph, these metals cannot be destroyed and at this time there is no known treatment technology that would eliminate the principal threat, toxicity. Treatment by stabilization is a part of the selected remedy, but it is not considered a principal element. The stabilization treatment technology will reduce the mobility of metals but not necessarily the toxicity.

DOCUMENTATION OF SIGNIFICANT CHANGES

One significant change has been made to the selected remedy as described in the proposed plan. The DEQ preferred alternative in the Proposed Plan called for the permeability criteria, which would be applied to the capping of the former Blackwell Zinc plant site, to be selected in the Remedial Design for the Soil Remediation Unit. The DEQ selected remedy has been modified based on the comments received on the Proposed Plan. The permeability criteria will not be established until after the Groundwater Remediation Unit remedial investigation and feasibility study is completed. The cap that will be required for the Soil Remediation Unit on the former Blackwell Zinc plant site shall be designed to be protective of direct contact hazards only. The primary criterion of concern is that it be eighteen inches in thickness. This thickness may be reduced at the discretion of DEQ for areas that are capped with concrete or asphalt rather than soil. The cost estimate of the DEQ Selected Alternative has been revised to reflect this modification. Further sampling of the facility will be required during the Remedial Design for the Soil Remediation Unit in order to determine the exact location and size of the cap that will be required by DEQ.

FOR MORE INFORMATION

If you would like to review the reports or any other documents contained in the updated Administrative Record file for the Blackwell Zinc Site, please visit one of the information repositories listed below. If you have any questions about DEQ's Proposed Plan, please call:

**Ms. Monty Elder at (800)869-1400 or
Mr. Scott Thompson at (405)271-7213.**

INFORMATION REPOSITORIES

City Hall
221 West Blackwell Avenue
Blackwell, Oklahoma 74631

Department of Environmental Quality
Waste Management Division
1000 N.E. 10th Street
Oklahoma City, Oklahoma 73117-1212

TABLES

TABLE 1 EVALUATION CRITERIA

Threshold Criteria

1. Overall Protection of Human Health and the Environment - How well does the alternative protect human health and the environment both during and after construction?
2. Compliance with Federal and State Environmental Standards - Does the alternative meet all applicable or relevant and appropriate (ARARs) state and federal standards and laws?

Balancing Criteria

3. Cost - What are the estimated costs of the alternative?
4. Long Term Effectiveness and Performance - How well does the alternative protect human health and the environment after completion of cleanup? What, if any, risks remain at the site?
5. Reduction of toxicity, mobility, or volume through treatment - Does the alternative effectively treat the contamination to significantly reduce the toxicity, mobility, or volume of the hazardous substances?
6. Short Term Effectiveness - Are there potential adverse effects to either human health or the environment during construction or implementation of the alternative? How fast does the alternative reach the cleanup goals?
7. Implementability - Is the alternative both technically and administratively feasible? Has the technology been used successfully on other similar sites?

Modifying Criteria

8. State/Federal Acceptance - Typically state acceptance is used as the criteria. However, since this is a state project, federal acceptance will be used as the criteria. Is the alternative acceptable to the federal government?
9. Community Acceptance - What are the community's comments or concerns about the preferred alternative? Does the community generally support or oppose the preferred alternative?

Note: These nine criteria are used to evaluate the remedial action alternatives. With the exception of the no action alternative, all alternatives must meet the first two "threshold" criteria. The next five criteria are used as "balancing" criteria for comparing alternatives and selecting a preferred alternative. After public comment, DEQ may alter its preference on the basis of the last two "modifying" criteria.

TABLE 2

The selected remedy will comply with the following ARARs.

CHEMICAL SPECIFIC ARARS		
Standard, Requirement, Criteria or Limitation	Citation	Application
Federal		
Solid Waste Disposal Act & Resource Conservation and Recovery ACT(RCRA)	40 CFR Part 261	Applicable. Some of the soils that will be removed from the site could exhibit the characteristic of toxicity. Any soils that exhibit this characteristic will require treatment.
Clean Air Act National Ambient Air Quality Standards	40 CFR Part 50	Relevant and Appropriate during construction activities
State		
Oklahoma Hazardous Waste Management Regulations	OAC 252:200	Applicable. Same reason as above.
Oklahoma Environmental Quality Act (Oklahoma Environmental Quality Code)	27A Oklahoma Statutes, Supp. 1996 Section 2-1-101 et seq.	Applicable. Soil contamination is a public nuisance.
Oklahoma Air Pollution Control Regulations	OAC 252:100	Applicable if air concentrations are above the maximum allowable increase due to remedial action.

TABLE 3

The selected remedy will comply with the following ARARs.

ACTION SPECIFIC ARARS		
Standard, Requirement, Criteria or Limitation	Citation	Application
Federal		
Solid Waste Disposal Act & Resource RCRA Subtitle C	40 CFR Part 261 264 & 265	Applicable. Portions may be relevant and appropriate to storage and treatment of waste for off-site shipment.
Occupational Safety and Health (OSHA) Regulations	29 CFR 1910	Applicable. During the remedial action at the site, it is the responsibility of employers involved in activities on the site to conform with the requirements of OSHA.
State		
Oklahoma Hazardous Waste Management Regulations	OAC 252:200	See criteria for 40 CFR Parts 261, 264, and 265
Oklahoma Air Pollution Control Regulations	OAC 252:100	Applicable if sufficient emissions were generated as a result of construction activities.
Oklahoma Solid Waste Management Regulations	OAC 252:500 & 510	Applicable to any offsite disposal of nonhazardous waste. Relevant and appropriate to any possible onsite disposal options.

Note: no location specific ARARs were identified.

RESPONSIVENESS SUMMARY
FOR THE SOIL REMEDIATION UNIT OF
THE BLACKWELL ZINC SITE

The following comments, comments 1 through 18, were received as oral comments from citizens attending a public meeting on the Blackwell Proposed Plan. The comments have been summarized in this document. DEQ's responses to the comments have been expanded in this Responsiveness Summary to more clearly explain the position of the Agency. Those proceedings were held at 221 West Blackwell, Blackwell, Oklahoma, on Thursday, July 20, 1995, starting at 6:30 PM. A complete transcript of the meeting may be obtained from the Customer Services Division of the Oklahoma Department of Environmental Quality.

1. What is the compulsion on the property owner to cooperate?

Basically, an access agreement will have to be negotiated with the property owner to gain access to the property to do the work. If someone refuses access then it may depend on the concentration levels that are in that yard as to whether or not we consider the yard a public nuisance or a potential problem to recontaminate other properties. Obviously, that yard is not going to be owned forever by the same person. Somebody else is likely to come live there who needs to know about this condition, if it's deemed to need remediation. What we would do is work one on one with the landowner and try to explain the process to them. The landowner needs to be aware that if you sell your property in the future or if your children try to sell your property in the future, you should warn any future buyers about this condition. Whether or not we will force a landowner to participate has not been decided. That decision will depend on the significance of the contamination on the property.

2. Where is the new soil going to come from that you're going to put back? Is it sod?

The Oklahoma Department of Environmental Quality (DEQ) is not concerned about where the replacement soil comes from as long as it has been tested and is clean. Sod will be obtained locally, if possible, and then whatever is needed will be brought into the community from outside.

3. When you decide what specific things you're going to do to each property, does the Federal government approve each individual action or do they just approve the plan as a whole?

The Federal government, the U.S. Environmental Protection Agency (EPA) for the most part, will review this document and comment on it. If EPA does not raise any serious objections or comments, the document will be found to be acceptable. EPA will also review the next document, the formal decision document, for approval. EPA will also review the Remedial Design document, which is a very specific, detailed engineering plan based on the decision for the site, and comment on that document. Once implementation of the Remedial Design is begun, EPA will keep track of the activities at the site. If EPA

determines at any point that what DEQ is doing is not of acceptable quality, then under the agreement between EPA and DEQ, EPA has the right to terminate the agreement and take over the project. They will review all the major milestones throughout the project.

4. Who and what determined in the past where you tested around the city?

EPA conducted a sampling event in the area in 1992. They sampled on a large grid at 100 different locations. In addition, they also sampled schools, day care centers, parks, and on the industrial site. These samples defined the outer boundary of the area EPA and DEQ are concerned about based on the levels of metals found in the samples. Then further sampling was done on the facility itself and in additional yards by the potentially responsible parties under the oversight of DEQ. When the remedial action begins, DEQ will start in residential areas near the boundary of the old facility and work outward, sampling each yard until no more significant contamination is reached.

5. A lot of that stuff was hauled off to yards. They literally filled the whole yard. Have you tested their soil?

DEQ is aware of areas, such as parking lots, which have had residue hauled in and the contamination may still remain exposed on the surface. If the residue is under an asphalt or cement cap, under a street for example, DEQ is not going to worry about that. If the residue is exposed at the surface, DEQ will make a case-by-case determination of what is appropriate to do with each situation. We will seek out those areas. We have not yet tested all such areas individually.

6. I own seven lots in the Smelter Heights area. I understand that you would take two feet off, approximately. Can we grow a tree out there if its not a cottonwood tree or a catalpa tree because that's the only thing thats growing out there now. I planted 19 fruit trees three years ago. Every one is dead. I've replaced a couple of them, and I've already lost a couple of them. I can't get a rosebush to grow out there. I've got two of them and they're dying. Everything I've got out there, if I grow a garden, I built up three railroad ties high, brought in my own dirt, mixed my own dirt, and I've got a garden growing. Now, when you go down two feet, will that be enough to take care of a fruit tree if you want to have a fruit tree out there, or is it just going to be anything that doesn't go two feet down on down? If I want a fruit tree, can I grow one?

It really depends on the situation. In some places the contamination does not go down more than two feet. Contamination may only extend down six inches or a foot. In that case, when the contamination is removed there should not be a problem. However, if there is significant contamination below two feet and you have a plant with a root system that goes below two feet, there might be a problem with trying to grow that plant. When each property is sampled the depth of contamination will be documented. The purpose of this remedy is to protect

human health. Levels of metals in the soil and the removal depth are set at a point which protects human health. The remedy for the Soil Remediation Unit is directed toward human health objectives.

7. At one point there was talk of buying out some properties. Will that be included in the remedy?

DEQ is not going to mandate that any potentially responsible parties buy property. DEQ is going to ensure that remediation levels are used that are appropriate for each area based on the land usage.

8. When you are talking about the individual yard sampling you forgot one consideration. A lot of these older homes and the frame houses and stuff that set on these - on the smelter site was wrecked and tore out two or three years ago. That property's been dozed and pushed around. So you couldn't get a proper sample, is what I'm trying to say, because the property has been moved around. The surface and stuff's been, because they dozed the foundations and the footings on those houses whenever they done some of this testing. I've got chunk of stove pipes as big as a golf ball coming up out of my yard.

When DEQ gets to individual yard testing, we will test your yard. Then we can talk to you about whether or not you have a problem. DEQ will try to work with individual property owners to make sure that sampling of each yard is representative of the actual level of contamination.

9. I noticed the DEQ alternative will cost \$4,600,000.00. Who is going to pay for this?

The potentially responsible parties will be required to fund the cleanup. The cost identified in the Proposed Plan for DEQs Preferred Alternative was an estimate. As the project progresses more accurate costs will be calculated.

10. What impact will the redediation have on existing industry in the industrial park area? Most of those plants have an area around them that I assume would require some cleanup.

There will be some effect because we will have construction activities occurring. There will be trucks and heavy equipment operating on the site. DEQ will require adequate dust control measures be taken during these activities. Our goal will be not to disrupt active industries on the site. Existing concrete slabs and buildings will not be disturbed. DEQ will not require industries to move out of the area. It is possible that soil around the existing buildings may have to be moved to a different location on the site for consolidation with similar materials.

11. How does depositing soil excavated from residential areas in the industrial park and ultimately capping it, limit the use of that area for future industrial expansion?

It is most likely that contaminated soil from residences will be consolidated in the southern half of the site. That might limit future use of that portion of the industrial park property. DEQ is willing to entertain the possibility of using concrete and asphalt building foundations, streets, parking lots, et cetera, as part of the cap system if it is done in an acceptable way. DEQ would like to facilitate the reuse of the industrial park property.

12. We're not looking at the potential of a huge pile of dirt out there using up space in the industrial area?

DEQ does not intend for that to happen.

13. I hauled dirt in, several truckloads, plant a garden, does real good one year. Next year, this stuff comes up through the dirt, no garden. Is that caused from the water level rising, or is that caused from the dirt mixing in, the dirt coming back up? It dies from the bottom up. It isn't salt, it's smelter.

DEQ cannot answer that specific question at this point. When some individual sampling in your yard is conducted we may be able to determine whether your gardening problems may be related to metals contamination in the soil.

14. Several times they tell us it's got cadmium in it, three or four times, and then they come back and say, no it ain't got than in it. I've got to where I don't believe those people.

DEQ will be splitting some samples. DEQ does not rely just on the private industry samples. We will split a percentage of samples and analyze them in the State Environmental Laboratory to verify the results.

15. Suppose they come in there and take and samples and say, well, it's okay. My property has already been condemned. You know, that it has contaminated soil. If somebody came tomorrow and said I'll give you \$2,000,000.00 for your home but I need to go to the bank and borrow the money, the banker says, no, we have contaminated property there.

DEQ may be able to help some of those types of situations as we go through this process. We will generate documents that show which areas are or are not contaminated. Areas that have been rededicated satisfactorily will also be identified in future documents.

16. Which properties will be sampled, in what area, and for which different elements?

The plan is to start at the old facility and go out from there in all directions, sampling each lot. In the Remedial Design, there will be criteria developed for how far the sampling must continue once the levels are below the remedial

action levels. For example, the plan may be to continue sampling for 2 blocks past the point at which samples are below the remedial action levels. The actual boundary will be developed by sampling. The soil will be tested for the elements lead, cadmium, and arsenic.

17. Do you have a timetable for completion of the project?

A detailed schedule will be developed as part of the Remedial Design. The Remedial Design was originally due in the spring of 1996. It has been delayed until the Fall of 1996.

18. I have a neighbor whose little boy is nine years old and he has leukemia. He attended Washington school where they did have hazardous material. He's been on four different chemotherapist and not any of them have worked successfully. Could that be traced to the hazardous material there, he lives just a block from the school.

Childhood leukemia is a great tragedy. The metals that were found in the soil, lead, cadmium, and arsenic, have never been shown to be related to leukemia of any type. Based on information in scientific and medical literature, exposure to those metals does not appear to cause leukemia.

The following comments, comments 19 through 29, were received in writing from a private citizen.

19. Is it appropriate to develop a "soil only remediation program" without considering the water problems at the same time? I am concerned that if it is decided that heavy metal contaminated soil is brought to the zinc smelter site for permanent storage, what plan to control the watershed across the property would be made?

The need to treat or contain groundwater that is already impacted will be identified during further studies associated with the Groundwater Remediation Unit. DEQ agrees that it is important to consider the potential impacts of waste disposal options on groundwater and surface water when selecting a remedy. Criteria for the cap called for in this Soil Remediation Unit will only address direct contact issues. That means the primary criteria for the cap will be a thickness requirement based on the material of which it is composed. An additional cap with different criteria may be required as part of the Groundwater Remediation Unit to insure groundwater and surface water are adequately protected.

20. Additionally, since there is no way to assure that water permeating a "soil/metal storage cell" would not leach soluble metals into other areas, how can one plan to leave giant amounts of such soil in storage cells lined only with clay? We know that the site of the present burial cells has not been protected in any way, as was proposed in the 1976 cleanup. The earth, or clay, cap was not only not protected, but was assaulted with

dumping, digging, earth moving, etc..... If the metals leach out and travel will they not decontaminate by means of water movement?

The capping of contaminated materials, where necessary, will preclude the infiltration of water and will reduce or eliminate the production of leachate containing the metals. If studies conducted in the Groundwater Remediation Unit indicate that treatment of groundwater is needed to stop the migration of metals from the site, then a groundwater treatment technology can be incorporated into the Remedial Action for the site.

21. Are we planning to just "chalk off the water contamination" as a done deal with no remedy? We have been told that the contaminated water is "contained" by geological conformation. Yet, recently when the water table was extremely high during a time of the river flooding, the tests results where water was releasing at the surface showed markedly increased incidences of metals. If this means that the water in the aquifer is not "contained" then how will we control the surface contaminants as they present themselves?

A final determination of the need to rededicate groundwater will be made at a later date once studies for the Groundwater Remediation Unit are complete. The increase in metals concentrations "when the water table was extremely high" occurred in monitor wells located on the south east corner of the former smelter plant location, not in the surface water. The groundwater does discharge to surface water near Ferguson Ave. but no elevated metals have ever been detected in the surface water at that location. Groundwater monitoring will be required for the Groundwater Remediation Unit.

22. My other very real concern regarding the water relates to the wells in this city. I understand that there are more than 100. I know that letters of caution have been mailed to a certain number of well owners. However, I also know that many citizens do not understand the health risks of casually consuming these contaminated waters for drinking, bathing, or watering certain types of plants. If it is found that nothing can be done to "clean the cadmium from the underground water", then I would encourage you to develop a plan for closing and plugging those wells.

The comment is noted and DEQ agrees that plugging of unused wells should be considered as part of the Groundwater Remediation Unit.

23. When do you intend to address the "waterway" that flows off the site and meanders it's way to the Legion Park? I have a burning concern for a permanent solution there, such as a concrete canal, because of the many little children who play in that water. Further, I do not think it should be addressed in later years, but now. That contaminated stream has been there long enough and we have no way of keeping the children out. So, they are exposed by standing in the water, ingesting the water, and perhaps other ways.

They have no idea that this stream is problematic and therefore, we must seek out an early and permanent solution to this particular stream.

DEQ shares your concern regarding the stream which flows through Legion Park. Before we can choose a final remedy for the stream some ecological studies will have to be conducted for the Ecological Remediation Unit. The stream is considered a high priority.

24. What about all of the contaminants that have been hauled off site and have been used for every conceivable purpose of "landfill"? There was some discussion about this in the staff meeting and again in the hearing. My impression was that if some of the materials from the smelter has been hauled off-site and if the land owner was aware of exposed contaminants that person could contact DEQ, City Engineer, or Mandioc requesting that their site be tested for metals. Is that correct? And, if that is the case, how do you propose to let all of the citizens of Blackwell know of this? We have a population of 7,500 persons and a newspaper of limited circulation. I understand that announcing the "public hearing" takes care of the legal obligation. But, what about the ethical situation here where children may be breathing in or touching, ingesting, or mixing some of these products with water, gardening, etc., and they have no awareness of the possible health risks? It was mentioned during one of the meetings that those citizens having smelter materials on their private property should certainly be expected to share in the expense of any remediation of their private property. What about those who cannot make life decisions for themselves if it involves a large outlay of money. We have a very large segment of elderly and retired persons living in Blackwell. We also have a great many poor families who must depend on "US" to make quality decisions on their behalf. There are many households which simply cannot afford to move or make improvements on their property. How do we reach them to give them the opportunity to inquire about testing? Would a "hand-out" to every home in this city be the fair and appropriate thing to do to be sure that ALL have the opportunity for testing if they know that those materials are on their property? My point is that this remediation should not depend on the local newspaper for informing the citizenry. I realize that such a circulation would take time and cost additional funds. However, if discrimination should be perceived on the part of any of these uninformed citizens who know what time and financial constraints that might produce. I, personally believe that a blanket mailing with IMPORTANT stamped on the envelope should be done before the testing option is concluded.

We have all talked about the fact that the potential for health risk was unknown back in those olden days when this material was "spread abroad". That may indeed be true. But the health risk that might exist now surely cannot be calculated to be the responsibility of the present land owner. I believe that this subject deserves some serious consideration before the soil remediation plan is permanently drafted.

It is not the intent of DEQ to pursue individuals for remediation costs. The potentially responsible parties have indeed indicated that they consider

individuals who may have used smelter materials on their properties to have some responsibility in regard to that material. DEQ will do whatever possible, within our legal authority, to see that any agreements do not place an unfair burden on individuals. The idea of sending a "hand-out" to every home may be feasible. DEQ is willing to work with the local community to see that information regarding the site is adequately distributed.

25. Do you intend to address the waterway that flows North of Ferguson, passes under Ferguson, and winds it's way through a park area, through the fairgrounds, and ultimately to the river?

At this time no samples have indicated any significant metals impacts to that stream segment. Further studies and monitoring will be conducted for the Ecological Remediation Unit.

26. What type of "dust control" could be used to keep metals from becoming airborne during the lifting, moving, hauling, and terracing of the contaminated soils? It is obvious that we could not put masks on the whole populace.

Dust control can be most easily accomplished through dampening the soil with water or other solutions. Similar activities have been conducted successfully at other sites.

27. I have noticed some earth moving going on North of the old TG&Y and EAST of the waterway which flows under HWY 11 traveling Northeasterly, behind the Sonic, D W Dozer and the old TG&Y. This waterway ultimately joins the Chikaskia River. Have you tested any of the soil in that area North of HWY. 11 which is frequently covered with water when we have lots of rain and the Legion Park waterway floods?

A sample has been taken by EPA at the confluence of the Legion Park stream and the Chikaskia River. That sample was not significantly contaminated with metals. Samples have also been collected through Legion Park which did indicate that the surface water sediments where significantly impacted. Further sampling is being planned for the stream segment from Legion Park to the Chikaskia River for the Ecological Remediation Unit.

28. I would like to state that I am in favor of doing a very thorough job in this remediation in order that it will never have to be addressed again. I realize that the outlay of capital is great and no funds should be squandered. But, I believe key areas.

In addition, I do not want to be an alarmist and press for methods of informing the public that would create fear. However, this whole project is about THE PEOPLE and the effects on their lives. Hiding facts, or allowing people to go uninformed is unethical and I cannot subscribe to the theory of "let the people call us." I am a member of the Steering Committee and we have had no forum of disseminating the information that we

have received, even if we could have understood all of it. There, certainly, is no interest on the part of the City staff to build an information program for the people. The reports in the city library do not inform those who do not know of their existence and who might be unable to understand the contents if they read them.

Therefore, I would encourage an immediate plan to communicate with all citizens in order to determine if smelter products are residing uncovered in any of the residential areas. I would further encourage you to address the Legion Park area as quickly as possible. And, finally, I would encourage you to cover the completed "burial areas" on the smelter site (south area) with concrete so that it will not be possible to disturb the contents underground and the concrete would also take care of the watershed problems.

Thank you for allowing me to give this input.

The comment is noted. See also response to comment 24.

29. The following is a statement citing my reasons for not leaving the final oversight of the Blackwell Remediation Program in the hands of the City Government, nor the Blackwell Industrial Authority.

While this statement, written earlier, is lengthy, I hope that you can understand my concern for the future health and welfare for the citizens of Blackwell.

This statement will tell the story of a "PLAN" for cleanup that was only partially attempted, incomplete and through the years simply LOST by way of no record keeping, changing administrations and simple ignorance. This statement is not intended to cast blame on any person or group, but rather to document the plan back in 1976 and the downside of the property ever since that time. The reason for the statement is to encourage you to design a "fail-safe" plan to monitor and keep this property safe from this day forward.

1. Estimated Clean-Up the first time around \$862,000
Ref.; Poe & Associates Developmental Report for N.C. Indust Park, Blackwell
pgs. 45-46 July 1976

Estimated materials to be cleaned up;
150,000 cu. yards
pg. 28- same report
2. It was suggested that the B.I.A. make efforts to market the materials remaining on the BZ site for the purpose of recovering the metals therein; cadmium, silver & zinc in residues Ref; Smelter Residue Report for NCIP
Poe & Associates July 1976 pgs. A-11 & A-12
Pgs 16 no replies received

3. Technical assistance study was accomplished under a grant with The Economic Development Assoc. U.S. Dept. of Commerce, EDA, T.A. Grant
No.08-6-01600
Ref. Smelter Residue Report, P&A.
Title Page

4. The Residue Report offered three alternatives for remediation of soil & "water contamination."
P. & A Smelter Residue Report P&A July 1976
pg. 17 Alternative C

This alternative for burial was chosen because it was cheap. Never mind that a conclusion had already been reached that insolubility of the metals within the waste could not be assured if the waste came in contact with water.

5. A plan for the three-phase project (described in SRR, P&A, July 1976, pgs 17-26.)
Page 26 also describes how water over the "pit" and drilling should be kept to a minimum. Yet, watershed controls were not implemented, as far as I have been able to discern and the "protected pit has been assaulted with "dumping" and no deterrents were in force by the B.I.A.
Note: Pg 30 of Development Report states that off-site water runoff flows through the residue area.

The OWRB approved the Poe plan on Sept 9, 1975.

The third phase of "the plan" was to provide control of on-site surface water, using curb and guttered streets to keep it from washing over metal contaminants in site debris and storage.
pg 31

6. In the 4-5 years that I have been interested in this project, I have not met one person in city government or associates thereof, who has acknowledged a full knowledge of this project. The two B.I.A. Managers of recent date, had no knowledge of it. As I went up the "chain of command" to investigate this "forgotten hazardous waste landfill," I was always met with "surprise." This has been there 20 years with water running over it, unprotected by concrete curbing, maintained drainage channels, fencing or any earth moving control measures. In addition, dumping has been haphazardly allowed, when the residue pit was mandated to have protection from water and penetration.

Summary of this point; when I began looking into the "potential environmental problem" at the industrial site and throughout the city and county, I did so on behalf of several citizens who had stabs or tests on their property and could not get any answers. In my quest for public information I was lied to, embarrassed, shunned and denigrated. It should not have happened. But, I persevered because I believe that citizens should not be victimized because of their lack of

knowledge or because they feel powerless to stand up for their rights to know. The logic of the earlier days translates to me that selective information is for "the city" to know and for the public not to know. Even today, when we are supposed to be operating as a "steering committee"-we have not "steered" anything. We have trusted, followed the reports as we are best able and tried to share information and quiet fears. In the meantime there are those who infer that real information is negative and cash registers will empty if we talk about our reality. And, there are those-so many of those who just have to sit and trust that the majority will be considered when a plan is made.

Because of this personal knowledge of the history of this site, I must request that the management of any permanent storage land in this city not be left up to the BIA of the City of Blackwell, to maintain and protect without oversight.

The comment is noted. All of the information generated throughout this project will be available to the public. DEQ is committed to encouraging citizen participation in this and other projects. Since waste will remain on the site, a review of the effectiveness of the remedy will be conducted by DEQ and EPA every five years.

GLOSSARY

Applicable or Relevant and Appropriate Requirement (ARAR) - The federal and state laws or regulations that a cleanup must usually attain. An applicable requirement is a promulgated federal or state standard that specifically addresses a hazardous constituent, remedial action, location, or other circumstance at a site. To be applicable, the remedial actions or the circumstances at the site must be within the intended scope and authority of the requirement. A *relevant and appropriate requirement* is a promulgated federal or state requirement that addresses problems or situations similar to those encountered at a site, even though the requirement is not legally applicable.

Cancer risk level - The potential for carcinogenic effects, evaluated by estimating excess lifetime cancer risk. This value is regarded as an upper-bound estimate of the potential cancer risk. Cancer risk levels are considered additive; that is, simultaneous exposures to more than one carcinogen in a given medium are added together to determine total cancer risk.

Operable Unit - A distinct portion of a Superfund site or a distinct action at a Superfund site. An operable unit may be established based on a particular type of contamination, contaminated media (e.g., soils, water), source of contamination, or some physical boundary or restraint.

Reference Dose (RfD) - An estimate of the daily exposure of the human population (including sensitive individuals) to a particular contaminant that is likely to be without an appreciable risk of deleterious effects during a lifetime.

Remedial action alternative - A potential method for cleaning up a site. Remedial action alternatives are developed from general response actions (e.g., removal and disposal), technologies (e.g., chemical treatment), and process options (e.g., stabilization) after screening. Possible remedial action alternatives include no action, institutional controls, onsite containment with no treatment, and removal and disposal options with or without treatment.

Remedial action objective (RAO) - Chemical- and medium-specific goals for protecting human health and the environment. RAOs typically specify the exposure routes, receptors, and risk levels of concern.

Remediation level - The final cleanup level (i.e., specific contaminant concentration in soil) that is established upon completion of the remedial investigation, feasibility study and any other necessary additional studies.

Remedy or remedial action - Those actions consistent with the permanent remedy taken instead of, or in addition to, removal action in the event of a release of hazardous substances to the environment so that they do not cause substantial danger to present or future public health or welfare or the environment.

Removal action - The cleanup or removal of released hazardous substances from the environment to minimize or mitigate damage to the public health or welfare or to the environment.